Case History

TrueClean™ Engineered Displacement Effectively Cleans Wellbore During Deepwater Direct Displacement

True™ Series Displacement Chemicals Offer Effective Synthetic Based Mud Removal While Water-Wetting Tubulars in Preparation for Completion Operations

CHALLENGE	SOLUTIONS	RESULT
• Perform direct displacement of SBM • Maximize displacement effeciency • Minimize post-displacement fluid system clean-up	• Engineered True Series displacement chemical spacer train • ClearDepth displacement hydrualic modeleing & WBCU tools • Systematic WBCU filtration process	• Effectively & safely displaced wellbore to completion fluid • Water-wet tubulars • Achieved or exceeded fluid cleanliness performance specifications

GULF OF MEXICO

OVERVIEW

In the Gulf of Mexico, operators with deepwater assets face distinctive challenges when transitioning from drilling to completion phases, specifically during the displacement from drilling mud to completion fluid. Large water depths require large marine risers, making it problematic when cleaning up the wellbore and riser sections in a timely manner. A direct displacement is favored in order to accomplish the objectives of minimizing the number of spacers pumped, hydrostatic control, and reducing rig circulating time.

CHALLENGE

A major operator in the Gulf of Mexico required a solution to directly displace a 14.0 lb/gal KRONOS™ low-ECD synthetic-based mud (SBM) to a 13.7 lb/gal $CaBr_2/CaCl_2$ completion fluid on a deepwater subsea well. The total volume of KRONOS™ to be displaced was 3,482 bbls. The water depth was 4,498’ (1,371 meters) with the well depth reaching a PBTD at 27,047’ (8,244 meters). The operator set completion fluid cleanliness specifications for the displacement at <30 NTUs out of the well and solids content at <0.05%.

Newpark Fluids Systems utilized lab tested chemistry and formulated the specific displacement chemical spacer train that separated the SBM from the completion fluid and water-wetted the tubulars, modeled the displacement hydraulics with ClearDepth that optimized the pump rates, annular velocities, and spacer contact times, relied on Archer wellbore cleanup (WBCU) tools that were sequenced and placed for physical cleaning of the wellbore and riser, and incorporated the use of Pro-T high-flow filtration equipment that allowed for rates up to 30 bpm which kept pace while the riser was boosted.

SOLUTION

The rig surface fluid handling system was thoroughly cleaned of residual SBM in preparation to receive completion fluid, while the drilling mud was circulated and conditioned to specifications prior to displacement. A True Series spacer train was formulated with TrueClean blended

solvent/surfactant utilized in both the weighted transition and cleaning spacers. These concentrations were customized to the specific drilling mud being displaced.

Spacer	Type	Description	True™ Series Products	Density	Volume
1	Thinning	Base oil		6.8 lb/gal	150 bbls
2	Transition	Weighted push	TrueClean [solvent/surfactant]	15.2 lb/gal	350 bbls
3	Cleaning	Weighted cleaning	TrueClean [solvent/surfactant]	13.6 lb/gal	296 bbls
4	Viscous	Weighted viscosified	TrueCell™ [liquid HEC] TrueZan™ L [liquid xanthan] TrueClean [solvent/surfactant]	13.5 lb/gal	80 bbls

The choke, kill, and boost lines were first displaced to completion fluid at 5-10 bpm using base oil and cleaning spacers. The spacers were pumped down the workstring at 6-9 bpm. The displacement spacer train was followed by 3,482 bbls of 13.7 lb/gal $CaBr_2/CaCl_2$. The pump rate was 14-18 bpm until the tail end of the viscous spacer passed above the BOP at which point the remainder of the displacement occurred at 25 bpm.

During the displacement, the workstring and WBCU tool assemblies were rotated between 30-60 rpm. Similarly, the workstring was reciprocated between 60-120 fpm once the displacement spacers were out of the workstring. Due to the available pit space, all surface completion fluid was filtered prior to the displacement to avoid the need to filter while displacing. Once initial completion fluid returned to surface, a TrueFloc™ flocculant treated lead brine volume was reverse circulated around the well. The riser was then boosted. A short-trip was performed followed by the BOPs being jetted and the riser boosted a final circulation.

RESULTS

The total displacement time from filling the service lines with brine to the fluid clarity endpoint was 17.75 hours. There were 3.3 well volumes circulated. The final fluid clarity endpoint result was 17 NTUs and <0.01% solids out of the well, which was better than the specified target established by the operator.

BOP Cleaner 4,580'

Riser Cleaner Magnet 4,412'

10.125" Well Filter 19,568'

10.75" Scraper 9,768'

10.75" Brush 7,210'

All spacers returned to surface as expected based on bbl/stroke calculations. The use of specific chemistries coupled with reliable hydraulics modeling, robust WBCU tools, and proper filtration resulted in a successful displacement. Newpark was awarded displacement services on additional wells for the operator.